

1 "monopoly inputs" provided by the local exchange
2 company to its customers.
3
4 Q4. Please define Total Incremental Cost and Average
5 Incremental Cost.
6
7 A4. Dr. Cornell defines the "Total Service Long Run
8 Incremental Cost" as the cost which would be
9 avoided were the product in question not to be
10 offered by a company, holding constant the volume
11 of production of all other products and services.
12 This cost would include both those costs which are
13 sensitive to the volume of service and the fixed
14 cost of the service. When this cost is spread
15 across all units of service (i.e., divided by the
16 volume of service), the result is termed by
17 Dr. Cornell "Average Total Service Incremental
18 Cost". In order to avoid cumbersome terminology,
19 these two concepts will be referred to as Total
20 Incremental Cost and Average Incremental Cost
21 respectively in my testimony.
22
23 Q5. How does Dr. Cornell propose using these costs to
24 set prices?
25

1 A5. Dr. Cornell advocates setting prices equal to or
2 above the Average Incremental Cost for each unit of
3 service. She suggests that a practical way of
4 doing this would be to calculate the Total
5 Incremental Cost of network "building blocks"
6 (e.g., such as customers' access lines to a central
7 office) and then compute the Average Incremental
8 Cost of each building block. She advocates that
9 the price of each building block should be set at
10 or above the Average Incremental Cost of the
11 building block.

12

13 Q6. Is Dr. Cornell's use of the Average Incremental
14 Cost as a pricing floor appropriate?

15

16 A6. No, I do not agree that Average Incremental Cost is
17 an appropriate lower bound on prices.

18

19 The following example will illustrate why Average
20 Incremental Cost is not an appropriate price floor.
21 Imagine that a single airline flight has a Total
22 Incremental Cost of \$15,000.00. This cost includes
23 the variable cost caused by each passenger equal to
24 \$10.00 per passenger (the meal, extra fuel, etc.),
25 as well as the fixed cost of the flight (the

1 pilot's salary, capital costs associated with the
2 aircraft, and so forth). If the aircraft
3 transports one hundred persons, the Average
4 Incremental Cost of the flight is \$150.00.
5 Now imagine the total market consists of two
6 categories of passengers, fifty business travelers
7 and fifty college students. The college students
8 are willing to pay \$100.00 but no more for a
9 ticket. The business travelers are willing to pay
10 \$200.00 for the flight. If each pays an amount
11 equal to their respective willingness to pay, the
12 total incremental cost of the flight is exactly
13 covered.
14
15 Now impose a requirement that everyone must pay at
16 least the Average Incremental Cost for the flight.
17 The college students will opt for alternatives
18 since they are not willing to pay \$150.00. If the
19 business travelers remain on the flight, they will
20 contribute ten thousand dollars towards the Total
21 Incremental Cost of the flight (\$14,500.00) leaving
22 a shortfall of \$4,500.00. Now either the flight
23 will be discontinued since it is no longer
24 financially viable or there will be an increase in
25 the burden to be born by the business travelers.

1 The business travelers would likely welcome the
2 college students back on the plane at this point;
3 even with disparate fares.
4
5 More generally, the Average Incremental Cost of a
6 service is not an appropriate pricing constraint
7 because pricing decisions usually affect the
8 volumes of service sold and rarely result in a
9 complete discontinuance of the service. As a
10 result, pricing decisions should rely on the cost
11 caused by the changes in volume of service and
12 should not include an artificial allocation of the
13 fixed cost of the service to individual units sold.
14 Average Incremental Cost (Total Incremental Cost
15 divided by the quantity of units of output)
16 contains the service's fixed cost. The fact that
17 any assignment of fixed costs to units of service
18 is artificial and arbitrary is underscored by a
19 statement authored by ten economists. "Some costs,
20 called fixed costs, do not change in magnitude when
21 the quantity of output for a given plant varies.
22 Hence, it is impossible to assign any specific
23 portion of these costs to a particular unit of
24 output."¹ An allocation of product-specific fixed
25 costs to units of output is essentially no

1 different than allocating the fixed joint and fixed
2 common costs of a company to units of output.
3 Economists reject allocating fixed costs to
4 individual units of service for exactly the same
5 reasons that we reject the allocation of other
6 fixed costs of the firm; such arbitrary spreading
7 of costs distort the decision making process.
8 Alfred Kahn summarized this point by saying "To the
9 extent that such costs are truly fixed, so far as
10 the continued provision of service is concerned,
11 they do not belong in the computation of marginal
12 cost, for purposes of economically efficient
13 pricing."²

14

15 Q7. Dr. Cornell claims that there are no fixed costs in
16 the long run. Therefore, would not long run
17 Average Incremental Cost act as an appropriate
18 surrogate for long run marginal cost?

19

20 A7. No, it would not. In her arguments, Dr. Cornell
21 misconstrues the role of fixed costs in the long
22 run. The word "variable" normally means
23 volume-sensitive. That is, the costs which are
24 sensitive to expansion or contraction in the volume
25 of service. In this regard, fixed costs are those

1 costs which are not sensitive to the volume of
2 service. For example, if a single product firm
3 were to produce more or less of its product, the
4 firm's fixed annual business license cost would not
5 be sensitive to changes in output volume and
6 therefore would be a fixed cost, even in the long
7 run. In the terminology of Management Accounting,
8 this fixed business license cost is called a period
9 cost and is caused by the passage of time, not
10 fluctuations in the volume of service.

11
12 A second distinct use of the term variable is
13 synonymous with "avoidable". When economists say,
14 "all costs are variable in the long run", they do
15 not mean that the cost of the business license
16 described above may someday become sensitive to
17 fluctuations in the volume of service. Instead,
18 they mean one can avoid all costs in the long run.
19 For example, one can avoid the fixed annual
20 business license cost by discontinuing business.

21
22 It is the confusion regarding these two uses of the
23 words fixed and variable which has led some
24 economists to conclude that all costs are volume
25 sensitive in the long run. This is simply not the

1 case. There are fixed costs in the long run and
2 they should not be included in long run marginal
3 costs, although they may be included in Average
4 Incremental Cost.
5
6 Q8. What are appropriate costs to use for constraining
7 prices?
8
9 A8. The prices charged by the local exchange company
10 for its services should be set over time, at levels
11 sufficient to recover over time, the long run
12 marginal cost of each unit of service sold. There
13 are occasions in which it is appropriate to price
14 below long run marginal cost and exceptions to the
15 long run marginal cost rule should be provided
16 accordingly. Never should prices be set below
17 short run marginal cost.
18
19 The proper criterion for deciding between short run
20 and long run marginal cost as a price floor is to
21 ask whether or not the cost can be affected now, or
22 in the future, by the pricing decision. In judging
23 the relevant choice among costs for pricing
24 decisions, it is useful to recall the most basic
25 definition of incremental cost. "The increase in

1 total costs resulting from an expansion in a firm's
2 volume of business is commonly referred to as
3 incremental cost."³ Thus, if a cost is not
4 affected by future anticipated expansions of
5 business due to a price decrease, or alternatively
6 if a cost is not saved by future contractions of
7 business due to a price increase, then it is
8 irrelevant in evaluating a price change. Said
9 another way, "inherent in the incremental cost
10 concept is the principle that any cost which is not
11 affected by the decision is an irrelevant cost for
12 purposes of that decision."⁴

13

14 Q9. In addition to including fixed costs in the
15 proposed pricing constraints, Dr. Cornell advocates
16 including sunk costs as well. Do you agree with
17 this conclusion?

18

19 A9. No, I do not agree. As mentioned earlier, it is
20 marginal cost, not Average Incremental Cost which
21 should constrain prices. Sunk costs are never
22 included in marginal cost. Furthermore, even if
23 one were to develop an Average Incremental Cost
24 rather than a marginal cost for use in pricing,
25 sunk costs should be excluded.

1 There are two errors in Dr. Cornell's reasoning
2 which lead her to include sunk costs in pricing
3 constraints. First, Dr. Cornell misinterprets the
4 meaning of the word "fixed cost" in this context.
5 She states, "Long run...refers to whatever period
6 is necessary that no costs are considered
7 fixed...it means that there are no categories of
8 costs that are considered sunk..." [NWC,P.28,L.1-4]
9 As I stated earlier, there are fixed costs in the
10 long run (albeit all forward-looking costs can be
11 avoided eventually). Hence, the basis for the
12 premise of the conclusion that there are no
13 categories of sunk costs, is wrong. It does not
14 help her argument to substitute the word
15 "unavoidable" for "fixed" since there will always
16 be, in any ongoing business, a set of prior costs
17 and prior cost commitments (even categories of
18 costs) which are irrevocable and therefore, sunk.
19 What Dr. Cornell may have in mind is the idea that
20 a firm with an indefinitely long life must
21 eventually recover the costs of (or even replace)
22 all of its resources and therefore, it must obtain
23 revenues sufficient to pay for such resources. I
24 don't disagree with this possibility. I do

25

1 disagree with using this concept as a basis for
2 establishing minimum current prices. In addressing
3 this very question, Baumol, et al. similarly
4 disagree. "However, an indefinitely long term view
5 of incremental costs is not appropriate, for some
6 fixed costs may be expected to remain fixed over
7 any time period and range of output that is
8 reasonable to consider in setting a price floor."⁵
9
10 The second error in Dr. Cornell's reasoning is in
11 her treatment of the cost of lumpy investments and
12 its implications for incremental cost studies. By
13 way of example, Dr. Cornell states "...even if the
14 existing switch is large enough to handle all
15 feasible levels of demand, switch costs must be
16 part of a long run study." [NWC,P.28,L.6,7] She
17 would include these switch costs in her Average
18 Incremental Cost calculation but she believes it
19 would not be included in a strict measure of
20 marginal cost. [See NWC,P.24,L.7-9] Dr. Cornell's
21 beliefs about these two important, logical
22 underpinnings for her conclusion that Average
23 Incremental Cost is superior to marginal cost in
24 establishing a price floor are incorrect.
25

1 First, contrary to Dr. Cornell's statement
2 [NWC,P.24,L.7-9], a strict measure of long run
3 marginal cost may, under some circumstances,
4 include capital costs of facilities even when there
5 is lumpy investment and (perhaps prolonged) excess
6 capacity. Second, contrary to Dr. Cornell's
7 statement [P.28,L.4-7], there are other
8 circumstances under which such costs will be
9 considered sunk forever and therefore, will not be
10 included in either long run marginal cost or
11 Average Incremental Cost.

12
13 A simple example will illustrate how capital costs
14 (e.g., of a currently under-utilized switch) are
15 properly included in marginal cost. Consider a
16 switch with a maximum capacity of serving 40,000
17 working voice grade access lines. Today, assume
18 this switch is half used and is projected to be
19 fully used in two years; at that time a new switch
20 of equal size and capacity must be added to
21 accommodate further growth.

22
23 Now consider a fluctuation in demand, say the loss
24 of 5,000 lines serving a nearby university with
25 ESSX service. The cost avoided by the local

1 exchange company as a result of this change in
2 volume of ESSX service will be in the form of the
3 ability to defer the purchase of the next switch.
4 This deferral will result in a cost savings to the
5 local exchange company approximately equal to
6 one-eighth ($5,000/40,000$) of a switch. That is,
7 even though the switch is "lumpy" and currently
8 under-utilized, the long run marginal cost of each
9 unit of service (ESSX lines), is determined by both
10 the share of capacity occupied by that unit, and
11 the cost of deferring or advancing the timing of
12 future investments. In conclusion, Dr. Cornell is
13 incorrect in her position that marginal cost,
14 properly calculated, will not include capital costs
15 of facilities with excess capacity due to lumpy
16 investments.

17
18 Although long run marginal cost can include lumpy
19 capital cost as described above, there are
20 important circumstances in which such costs should
21 be considered sunk and not included in either long
22 run marginal cost or Average Incremental Cost.
23 Note that the previous discussion made reference to
24 forward-looking investments as they are affected by
25 a change in the volume of service offered. No

1 reference is made to embedded costs. The
2 investment in the existing switch is sunk (from the
3 economy's view) and may be unavoidable (from the
4 firm's view). In particular, if the capacity of
5 the switch will never be reached, changes in the
6 current volume of service have no implications for
7 either the size or timing of the next switch
8 investment. Therefore, switch investment costs
9 will not be included in the long run marginal cost
10 of a service using the switch.

11
12 Furthermore, the switch investment costs would not
13 be included in the Total Incremental Cost of
14 ESSX Service (and therefore these costs are also
15 not included in the service's Average Incremental
16 Cost). To see this clearly, refer to Dr. Cornell's
17 definition of Total Incremental Cost (recall that
18 she uses the synonymous term "total service long
19 run incremental cost"). "Total service long run
20 incremental cost is the change or increment in the
21 total cost of the firm caused by producing all of
22 the particular service or product, measured over a
23 period long enough that it includes both fixed and
24 variable costs." [NWC, P.22,L.14-17] In the
25 switch cost example of the preceeding paragraph,

1 there is no switch investment ever avoided by the
2 discontinuation of the total ESSX service since
3 other services will continue to utilize the same
4 switch. Therefore there is no basis for including
5 this (sunk) cost in Average Incremental Cost of
6 ESSX Service.

7
8 In summary, the proposal to substitute Average
9 Incremental Cost for marginal cost in establishing
10 proper price floors is founded on some important
11 misconceptions. The same can be said for Dr.
12 Cornell's refusal to exclude sunk costs from
13 Average Incremental Cost.

14
15 Q10. Dr. Cornell states [NWC,P.28,L.19-22] that by
16 disregarding sunk costs the company is really
17 arguing for short run rather than long run cost.
18 She provides three exceptions that might be used to
19 justify the use of short run costs. Do you agree
20 with these criteria?

21
22 A10. No, I do not agree. She states
23 [NWC,P.29,L.26;P.30,L.1-6] that three conditions
24 must hold in order to price below long run
25 incremental cost. These conditions are (and I

1 paraphrase) 1) the service is experiencing a
2 permanent reduction in demand, 2) the service uses
3 facilities which have no other use within the local
4 exchange company, and 3) the stockholders rather
5 than the ratepayers pay any losses associated with
6 any resultant under-recovery of costs.

7
8 I disagree with her first criterion in that it is
9 not a reduction in demand which causes an
10 investment to be considered sunk. It is instead
11 the fact that the projected demand will never grow
12 to exhaust the capacity previously provided.

13
14 I disagree with her second criterion in that it is
15 not how the facilities are used that determines
16 whether they are relevant or not but whether the
17 costs of those facilities can be affected by any
18 decisions made now or in the future. For example,
19 if conduit is placed in the ground to house copper
20 cable and future expansion of service will cause
21 additional conduit to be placed, then serving
22 additional demand today may advance the timing of
23 the next conduit placement and therefore affect the
24 company's conduit costs. Accordingly, we would
25 include the cost of that conduit in the long run

1 marginal cost of the new demand. However, if new
2 technologies arrive which allow us to avoid placing
3 new conduit for any foreseeable growth in demand,
4 then serving new demand will never cause increased
5 conduit costs to be incurred either through
6 expansion of the facility or advancement in the
7 timing of the next placement of conduit. Therefore
8 the cost of conduit will not be relevant when
9 assessing the cost of the new demand. It is not
10 the use of conduit which determines the costs but
11 rather how future construction of facilities is
12 affected by the use.

13

14 With respect to the third criterion, that
15 stockholders and not ratepayers must pick up any
16 shortfall between long run incremental cost and
17 revenues received, this is a value judgment on
18 Dr. Cornell's part and is not a principle of the
19 economics of cost causation.

20

21 Q11. Dr. Cornell advocates the costing and pricing of
22 individual building blocks of "network functions"
23 as a means of calculating costs which would
24 constrain the prices charged by local exchange
25 companies. Do you agree with this approach?

1 All. No, I do not agree. The first problem with the
2 approach is that the costs per building block can
3 vary according to the service the building block
4 provides. For example, economies of scale affect
5 the incremental cost of providing additional
6 capacity to a single customer's premises.
7 If we were to adopt Dr. Cornell's approach to
8 costing, we could conclude that it must cost ten
9 times as much to serve an ESSX customer with two
10 hundred ESSX access lines as to serve that same
11 customer with 20 PBX trunks. This denies the
12 economies of scale of serving more capacity to a
13 single customer's premises.
14
15 Economies of scope also are relevant to this
16 example. By providing the customer with access to
17 the local network, the incremental cost of a second
18 service (e.g., intercom services) may be smaller
19 than would be the case if one were to provide the
20 two services stand alone. These economies of scope
21 and scale play a role in determining who is the low
22 cost and therefore, most efficient provider of the
23 service and are incorrectly reflected by the
24 building block approach.

25

1 A second problem with the building block approach
2 is that it fails to recognize the value each
3 customer or type of service might receive from a
4 building block. One important aspect of
5 competition is to ensure that resources are
6 allocated to their most valuable use. The value of
7 a building block to one customer may be much higher
8 than the value to another. If a choice must be
9 made as to which customer receives the service, we
10 would wish to allocate the resource to the use
11 which results in the highest value. The value
12 received by the customer is determined by the
13 service the building block performs. Prices must
14 be set as much based on value received by the
15 customer as based on the choice of technologies and
16 resources which are used to provide the service.

17
18 The third problem with the building block approach
19 is that it leads to an over-allocation of costs.
20 In the case of the airline flight example used
21 earlier, we might think of each coach class seat as
22 a building block and allocate the cost of the
23 flight accordingly. This cost would include,
24 according to Dr. Cornell's proposal, both the

25

1 volume sensitive and fixed cost of the service. As
2 described earlier, this may cause a financially
3 viable or profitable flight to be abandoned, or
4 could increase the financial burden of the
5 remaining passengers.

6
7 Dr. Cornell goes beyond allocating the fixed cost
8 of the service to units of service with her
9 building block approach. For example, she states
10 that "since basic Centrex-like offerings include
11 some features that use processor time, the charge
12 for this processor time is included in the Centrex
13 column." [NWC,P.42,L.9-11] For processors which
14 are not likely to congest or exhaust, (as may be
15 the case for large digital switches in many central
16 offices today,) the cost of the processor capacity
17 must be considered a fixed shared cost of all of
18 the services which use processor time because the
19 cost of the processor does not change with the
20 volume of service, nor with any single entire
21 service offering. The allocation of these fixed
22 costs is precisely what the controversy over fully
23 allocated cost verses incremental cost is all
24 about. Economists have resolved long ago that such
25 allocations are inappropriate for pricing

1 decisions. Under-utilized processor capacity
2 cannot be more efficiently used by allocating its
3 costs. Less efficient use will result. A lesson
4 from the railroad industry illustrates the problem.
5 "The least effective way to cope with unutilized
6 railroad capacity would be to include its fixed
7 costs in floors for pricing. For the high prices
8 which would result could only discourage
9 utilization of these facilities and aggravate the
10 condition."⁶

11
12 In summary, the building block approach may favor
13 competitors over consumers. In addition, it is
14 likely to lead to inefficient prices, inefficient
15 capacity utilization, and inefficient competitive
16 entry because the arbitrary allocation of fixed
17 product and fixed joint cost to units of service
18 will overstate the cost of some units of service
19 while understating the cost of others. Wherever
20 costs are overstated and prices are so constrained,
21 it allows for potentially inefficient competitive
22 entry into the more lucrative segments. The more
23 traditional approaches to pricing, based on
24 marginal costs as discussed widely in the economic
25 literature, should not be abandoned in favor of

1 this so called building block approach to pricing.

2

3

4 Q12. Dr. Cornell and Dr. Mayo both advocate charging the
5 same price for "monopoly inputs" sold to customers
6 and competitors of the local exchange company. Do
7 you agree with this conclusion?

8

9 A12. No, I do not agree. But my disagreement must be
10 carefully interpreted so as not to be misconstrued.
11 There is no question that differential pricing can
12 improve the public welfare. Baumol, et al. state
13 "Differential pricing is consistent with the public
14 interest in the economical utilization of
15 resources."⁷ The economics literature abounds with
16 conclusions that nonlinear pricing (of which
17 differential pricing is a special case) is superior
18 to constant prices in serving the public interest.
19 The example cited earlier in my testimony regarding
20 the seats on an airplane illustrates one aspect of
21 this superiority. The conclusion that differential
22 pricing can promote the public interest is
23 inescapable.

24

25 In addition, more harm than benefit is likely to

1 result from imposing constant prices. For example,
2 I have already mentioned that there are economies
3 of scale associated with serving greater capacity
4 to a single customer's premises. To deny these
5 economies to customers who buy large access
6 capacity would result in uneconomic bypass,
7 unnecessarily high cost imposed on customers who
8 remain on the network, and ultimately, increased
9 rates for basic ratepayers. To illustrate with an
10 extreme example, designate a building block as a
11 voice grade equivalent channel between a customer's
12 premises and the central office. Were all
13 customers to pay the same price for that building
14 block, all business customers, ESSX customers,
15 residential customers, and interexchange carriers
16 would be charged exactly the same for each voice
17 grade equivalent channel. Interexchange carriers
18 and large business customers would no doubt find it
19 beneficial to interconnect with the network at a
20 flat rate residential price. Alternatively,
21 residential customers and small business customers
22 could pay the larger business or interexchange
23 carriers' rate, but they would no doubt be
24 exceedingly unhappy. A better alternative is to
25 retain the tradition of recognizing the different

1 costs and values placed on network services by
2 different customer segments.

3

4 To summarize on this point, there is much benefit
5 to be retained by allowing differential prices to
6 prevail among the different customer segments which
7 use the same building blocks of the network.

8

9 Q13. What costs should be used for the minimum pricing
10 of toll-related services by the local exchange
11 companies?

12

13 A13. The lowest price which could be charged for any
14 unit of service, under any circumstance, is the
15 telephone company's own short run marginal cost for
16 providing that unit service. The local exchange
17 company should only price this low in exceptional
18 circumstances described earlier in my testimony.
19 Under other circumstances, the local exchange
20 company's own long run marginal cost is the
21 appropriate price floor. This long run marginal
22 cost is determined by calculating costs which rise
23 or fall with changes in the volume of each service
24 offered. No other price constraint should be
25 imposed. Specifically, a constraint to price at or

1 above Average Incremental Cost should be rejected.
2 The above recommendations on minimum pricing do not
3 relieve the local exchange company from the
4 responsibility of recovering costs not included in
5 marginal cost. These costs, however, should be
6 recovered in the aggregate and not by arbitrary
7 cost allocation to individual units of service.
8
9 Q14. Would you please summarize your assessment of
10 Dr. Cornell's positions on cost and pricing as
11 presented in her testimony?
12
13 A14. Yes, I will. Dr. Cornell goes well beyond the
14 traditional application of economic principles in
15 the allocation of costs to services and to
16 individual units of service for purposes of
17 selecting minimum prices. Not only does she
18 advocate the allocation of fixed product costs to
19 units of service, but she advocates the allocation
20 of some shared fixed costs as well. The allocation
21 of such cost is contrary to the marginal cost and
22 pricing principles in the economics literature.
23
24
25 Q15. Does this conclude your testimony?

1 A15. Yes, it does.

2

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